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# An Experimental Augmented Reality Platform for Assisted Maritime Navigation

Olivier Hugues  
MaxSea – ESTIA Recherche  
Bidart France  
+33 5 59 41 70 96  
o.hugues@net.estia.fr

Jean-Marc Cieutat  
ESTIA Recherche  
Bidart, France  
+33 5 59 43 84 75  
j.cieutat@estia.fr

Pascal Guitton  
University Bordeaux 1 (LaBRI) & INRIA  
Bordeaux, France  
+33 5 40 00 69 18  
guitton@labri.fr

## ABSTRACT

This paper deals with integrating a vision system with an efficient thermal camera and a classical one in maritime navigation software based on a virtual environment (VE). We then present an exploratory field of augmented reality (AR) in situations of mobility and the different applications linked to work at sea provided by adding this functionality. This work was carried out thanks to a CIFRE agreement within the company MaxSea Int.

## Categories and Subject Descriptors

H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems — Artificial, augmented and virtual realities; I.3.7 [Computer Graphics]: Three-Dimensional Graphics and Realism—Virtual reality.

## General Terms

Experimentation, Human Factor, Security.

## Keywords

Augmented Reality, Mixed Environment, Image Processing, Human Factor, Combining exteroceptive data.

## 1. INTRODUCTION

The continuous progress of new technologies has led to a proliferation of increasingly smart and powerful portable devices. The capabilities of devices on board a ship now enable crews to be offered a processing quality and volume of information until now unrivalled. In a hostile environment such as the sea, users need a relevant flow of information. Computer assisted vessel management is therefore increasingly widespread and digitalisation is an inescapable development. The three main aims are as follows:

1. Improved safety (property, environment and people)
2. Increased gains from productivity (fishing, etc)
3. The representations required for environmental control (orientation, location and direction)

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These aims have led maritime software publishers to develop increasingly sophisticated platforms, offering very rich virtual environments and real time information updates. There are many companies on the embedded maritime navigation software market. They can be separated into two categories. The first part includes those, which develop applications enabling embedded sensors to be taken advantage of (radar, depth-finder, GPS, etc.), such as Rose Point [4], publisher of Coastal Explorer software (Figure 3) and MaxSea International [14], publisher of the MaxSea TimeZero software (Figure 2). Other companies offer hardware platforms in addition to their software applications, like Furuno [10] (Figure 4) and Garmin [11] (Figure 1).



Figure 1. Garmin

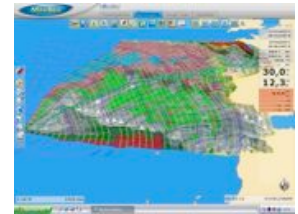


Figure 2. MaxSea



Figure 3. Coastal Explorer



Figure 4. Furuno

These environments enable navigation to be greatly improved by only showing the necessary information, eg. by combining satellites photos of the earth and nautical charts like PhotoFusion in Figure 5 proposed by MaxSea [14].